The Fundamentals of Nitrogen Fixation

by J.R. Postgate

Cambridge University Press; Cambridge, 1982
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There are very few people who have the breadth of knowledge and clarity of style to write about nitrogen fixation as John Postgate does. This monograph, which is as much a testament to his own pioneering efforts in nitrogen fixation as it is to that of others, is presented in an exciting and eminently readable form that cannot fail to capture the imagination of veterans and novices alike.

Our knowledge of the various aspects of nitrogen fixation at the chemical, biochemical, physiological and genetic level has exploded since 1960 and this book covers most of that knowledge in an extremely well documented form. These are dealt with in nine sections. The first two sections on the nitrogen cycle and the nitrogen-fixing bacteria are fairly short and serve as an appetizer for the main courses on enzymology, physiology, genetics and ecology, followed by desserts of origin and evolution, chemistry and mechanism and finally a scheme for nitrogenase action. Each section is carefully prepared for the individual palate by giving the reader sufficient background information to be able to assimilate and digest what is subsequently served up.

The section on enzymology gives a brief summary of developments up to 1960 when the first cell-free extract that consistently fixed dinitrogen was prepared and goes on to detail (often in a chronological form where appropriate) various properties of the nitrogenase complex and their relevance to the overall enzymology of the process.

The physiology section is presented at two levels, the descriptive and analytical. Descriptive physiology addresses the strategies employed by aerobic diazotrophs in their attempts to overcome the problem of oxygen toxicity to the intrinsically O_2-sensitive nitrogenase and how this affects their overall physiology. There are also sub-sections on the role of dihydrogen and electron transport pathways in nitrogen fixation. Analytical physiology encompasses the various ways in which ammonia, oxygen, molybdenum and energy supply regulate the nitrogenase. The section on genetics, covering as it does an incredible advance in knowledge over a dozen years or so, is summarized in a cogent form that the novice could readily use as a primer for the many advanced papers quoted. Postgate, quite wisely, refers to J.I. Sprent's book on the 'Biology of Nitrogen Fixing Organisms' (McGraw-Hill, 1979) to complement his own section on Ecology which can only be regarded as a brief overview of the subject. The remaining sections on evolution, chemistry and scheme for nitrogenase action are also rather brief but very much to the point and clearly reflect the writer's personal interests in these areas.

On the whole a great success with very few errors although I'm still not sure how to spell Azotobacter(i)aceae!

Howard Dalton